

## ORIGINAL ARTICLES

# COMPARISON OF RENAL FUNCTION BEFORE AND AFTER PYELOPLASTY DETERMINED BY $^{99m}\text{Tc}$ -DTPA RENOGRAPHY

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### Abstract

*Objective:* To evaluate the renal function before and after pyeloplasty using  $^{99m}\text{Tc}$ -DTPA renography to determine the outcome of pyeloplasty done for pelviureteric junction obstruction.

*Materials and Methods:* This study was done in the department of urology, National Institute of Kidney Diseases and Urology from July 2008 to June 2009. Forty eight patients were included in this study who underwent Anderson Hynes pyeloplasty for pelviureteric junction (PUJ) obstruction. All patients were evaluated with diuretic  $^{99m}\text{Tc}$ -DTPA renography before and at 3 months after operation. Ultrasonography was performed to categorize the severity of hydronephrosis before renography. The outcome of pyeloplasty was evaluated by comparing preoperative and postoperative differential renal function determined by  $^{99m}\text{Tc}$ -DTPA renography.

*Results:* Forty eight patients with unilateral hydronephrosis were included in this study. Of these patients 32 male and 16 female with mean age 24.8 years (range 5 years to 42 years). Diuretic renography was done using  $^{99m}\text{Tc}$ -DTPA in all patients preoperatively and at 3 months postoperatively. Preoperative mean differential renal function was 8.11% (range 0 to 22%) and postoperative mean differential function was 20.48% (range 0 to 42.8%) at 3 months. In 44 (91.67%) case there was significant improvement of renal function where in remaining 4 patients no change was observed.

*Conclusion:* Renal function improved after Anderson Hynes pyeloplasty regardless the age of the patient at surgery which was determined by  $^{99m}\text{Tc}$ -DTPA renography. Pyeloplasty performed on patients with relatively better differential function had better results.

**Keywords:** Hydronephrosis, PUJ obstruction,  $^{99m}\text{Tc}$ -DTPA renography. Differential renal function, Anderson Hynes pyeloplasty.

### Introduction:

Hydronephrosis due to PUJ obstruction occurs in all paediatric age groups, but today the majority of cases are identified and diagnosed in the perinatal period<sup>1</sup>. Beyond neonatal period UPJ obstruction is seen during

childhood and adolescence to a lesser degree. Current understanding of the pathophysiology of obstructive uropathy is incomplete and there is controversy in regard to the indication and optimal timing of surgical management in diagnosed cases of UPJ obstruction<sup>2,3</sup>. The most popular procedure is the Anderson Hynes dismembered pyeloplasty which can be done with or without stenting. Dismembered pyeloplasty for congenital obstructive uropathy appears to offer resolution of impairment of urinary flow but its effectiveness in reversing impair renal function is questionable, because many patients treated with pyeloplasty renal function continues to deteriorate after surgery<sup>4</sup>. However, some studies have shown that even obstructed kidney with relative impairment of renal function have the capacity to improve<sup>5</sup>.

To evaluate the renal functional status and outcome of different treatment modalities, commonly used and relatively cheap investigation is radionuclide  $^{99m}\text{Tc}$ -DTPA renal scan<sup>6-7</sup>.

The present study was conducted to compare the renal function determined by DTPA renogram before and after pyeloplasty.

### Materials and Methods:

This prospective study was done in the department of urology, National Institute Kidney Disease and Urology from July 2008-June 2009. A total of 48 patients were included in the present study with unilateral hydronephrosis due to pelviureteric junction obstruction. Patients with bilateral renal obstruction, VUR, malformation of urinary tract, solitary kidney with obstruction and associated with bladder dysfunction were excluded from the study. All patients were initially assessed by ultrasonography to categorize the severity of hydronephrosis before pyeloplasty. Then the patients evaluated with  $^{99m}\text{Tc}$ -DTPA renography. Dynamic sequential images of the kidney were obtained in posterior position immediately after IV administration of 2mCi dose of  $^{99m}\text{Tc}$ -DTPA and the study continued for 30 minutes. A 1mg/kg dose of furosemide was given intravenously at 11<sup>th</sup> minute after injecting the radionuclide.

Anderson Hynes pyeloplasty with stenting was done based on a combined interpretation of the diuretic renography and ultrasonography. Patients were discharged from the hospital on 10<sup>th</sup> postoperative day and were advised to come for removal of the stent after one month. Then renography were performed to determine the differential renal function at 3 months. Statistical analysis was performed using statistical software with paired Student's t test and statistical significance considered at p=0.05.

**Results:**

All the included 48 patients (mean age 24.8±13.6 years, range 5-42 years) with unilateral hydronephrosis underwent Anderson Hynes pyeloplasty. There were 32 (66.67%) males and 16 (33.33%) females. Hydronephrosis on the left side was in 30 (62.50%) cases and on the right side 18 (37.50%) cases. In all patients there was ultrasonographic evidence of moderate to severe hydronephrosis. Hydronephrosis was moderate in 21 patients (43.75%) and severe in 27 (56.25%) patients (Table-I).

**Table-I**

*Distribution of patients according to Degree of Hydronephrosis on Ultrasonography Preoperatively (n= 48)*

Degree of Hydronephrosis	No. of Patients	Percentage
Moderate	21	43.75
Severe	27	56.25
Total	48	100

Diuretic renography was done using <sup>99m</sup>Tc-DTPA in all patients preoperatively and 3 months postoperatively. Preoperative differential function was less than 20% in 42 (87.50%) cases, 20% -30% in 6 (12.5%) cases (Table-II) and mean renal function was 8.11% (range 0 to 22).

**Table-II**

*Distribution patients according to preoperative differential renal function on DTPA renogram (n=48)*

Differential renal function	No. of Patients	Percentage
<20%	42	87.50
20%-30%	6	12.50
Total	48	100

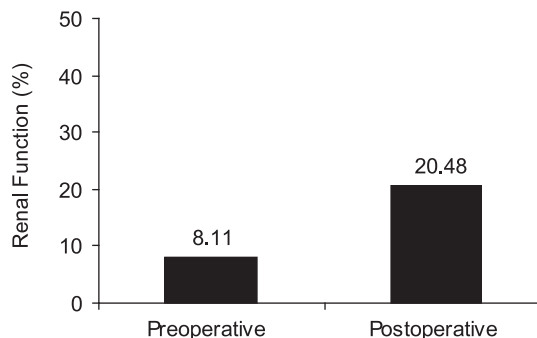
All the 48 patients underwent Anderson Hynes pyeloplasty with stenting. Stent was removed after one month. Then diuretic renography was done at 3 months postoperatively. Renal function improved significantly postoperatively. Postoperative renal function was less than 20% in 27 (56.25%) cases, between 20 to 30% in 15 (31.25%) cases and more than 30% in 6 (12.50%) cases (Table-III).

**Table-III**

*Distribution patients according to postoperative differential renal function on DTPA renogram (n=48)*

Differential renal function	No. of Patients	Percentage
<20%	27	56.25
20%-30%	15	31.25
>30%	6	12.50
Total	48	100

Mean differential function was 20.48% (range 0-42.8). Four patients with differential renal function 0% preoperatively did not improve postoperatively after 3 months and it remained as before.



**Fig-1:** Mean renal function before and after pyeloplasty.

**Table-IV**

*Changes in differential renal function before and after pyeloplasty.*

Differential renal function (%)	Prepyeloplasty	Postpyeloplasty	t	df	P -value
Mean ± SD	8.11± 8.06	20.48±14.73	6.84	47	<.001
Range	0-22	0-42.8			
Change of Differential function		12.61			

Paired Student's t test.

Overall paired t test comparison of differential renal function before and after pyeloplasty revealed significant improvement of differential renal function (mean 8.11% versus 20.48%,  $p < .001$ ) (Table-IV).

#### Discussion:

In the present study, the renographies of all 48 patients treated by means of Anderson Hynes pyeloplasty for unilateral pelviureteric junction obstruction were analyzed. <sup>99m</sup>Tc-DTPA renography was performed in each patient both preoperatively and postoperatively at 3 months.

Of the 48 patients DTPA scans before and after pyeloplasty 44 (91.67%) patients showed improvement in the post pyeloplasty scan. Four other patients had no change. Patient with pre operative renal function <20% had limited improvement. Among 42 patients with renal function less than 20% had improved renal function between 20-30% in 13 cases and 2 had improved more than 30%. Some advocate early repair using a differential function of <35-40% as an indication for surgery, so that renal functional potential is thereby maximized<sup>6-11</sup>.

Palmer et al. performed a multicentre prospective randomized study of high grade obstructive unilateral hydronephrosis for the Society for Fetal Urology<sup>12</sup>. Patients had at least grade 3 hydronephrosis and renal function greater than 40% for study inclusion. In patients who underwent surgical procedures renal scintigraphy showed significant improvement of hydronephrosis and drainage time 6 and 12 months respectively, after pyeloplasty compared with those who continued on the observation protocol. Palmer et al. inferred that early surgical therapy improves renal drainage and hydronephrosis. In the present study patients with moderate hydronephrosis had better improvement postoperatively than severe hydronephrosis which agree with study done by Palmer et al.

In the present study renal functional differences did not depend on patient's age at surgery. McNeily et al. reviewed 75 cases of unilateral paediatric ureteropelvic junction obstruction in which nuclear renograms were available for renal function measurement<sup>13</sup>. They did not observe any age related changes in renal function postoperatively from that at presentation and concluded that increasing patient age does not adversely affect functional outcome after pyeloplasty. Their results are consistent with the present study.

In the present study six patients had preoperative renal function between 20%-30% and out of them 4 (66.67%)

patients improved their renal function above 30% and other two improved their function but it remained below 30%. So, relatively better kidney had improved surgical outcome in terms of renal function. Chertin et al. performed a study with 113 patients with moderate to severe hydronephrosis. In all patients postoperative follow up ultrasound and renal scan revealed significant improvement of hydronephrosis and wash out curve pattern<sup>14</sup>. There was a significant difference between moderate and severe hydronephrosis in regard to renal function improvement postoperatively, 66% in moderate hydronephrosis and 16% in severe hydronephrosis,  $p < 0.05$ . So these findings are consistent with the present study.

In the study by Ulman et al. eight children were operated because of a reduction in differential function of >10% and none of them had permanent loss of renal function and differential function recovered to more than the levels before deterioration<sup>15</sup>. In the present study 44 (91.67%) patients out of 48 patients also had improvement in their renal function which is also consistent with the results of Ulman et al. These observations are also similar to the results of Chertin et al<sup>16</sup>. In their study 36 of 44 children operated because of deterioration in differential functions of more than 5% regained their initial level of kidney function 6-12 months after surgery. It is found that the results of most of the studies are consistent with the results of the present study.

#### Conclusion:

In this study all patients had moderate to severe hydronephrosis. There was significant improvement of renal function after Anderson Hynes pyeloplasty. So, which may be considered as an effective treatment option for most of the patient with pelviureteric junction obstruction. Pyeloplasty performed on patients with relative better differential function had better results but patient age at surgery did not had any impact on improvement of postoperative renal function.

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